WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005MT59B

Title: STUDENT FELLOWSHIP: Movements of resident and non-resident anglers in Montana: implications for transferring whirling disease among drainages

Project Type: Research

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Abstract

Myxospores represent one component of the life cycle of Myxobolus cerebralis or whirling disease. Myxospores are released into the benthic sediment of streams after an infected fish dies (Hedrick et al. 1998) and the spores are ingested by Tubifex tubifex.

Myxospores are highly resilient to environmental stress. For example, they can survive for freezing at -20°C for three months (El-Matbouli and Hoffmann 1991). Bartholomew and Reno (2002) found that M. cerebralis can persist in ponds without fish for 30 years. Similarly, Halliday (1976) cites several references that indicate myxospores are viable from 12 to 30 years. Myxospores can also survive passing through the guts of birds and fish (El-Matbouli and Hoffmann 1991). Further, myxospores can likely survive desiccation because of their hard shell (Kerans and Zale 2002). Myxospores can experience mortality when exposed to high temperatures (60-100°C) for 10 minutes (Hoffman and Putz 1969).

Myxospores are small and disperse by water currents, thus they are most likely to be deposited in areas of low velocity and fine sediments (Kerans and Zale 2002). The abundance of myxospores in these areas is often unknown and difficult to quantify (Lemmon and Kerans 2001). However, Lemmon and Kerans (2001) found that myxospores could be extracted from the sediments using a plankton centrifuge and sodium hexametaphosphate. They suggested that their technique could be refined to provide more insight into the myxospore load in the wild. Polymerase chain reaction (PCR) has been successfully used to detect M. cerebralis DNA.

Despite all the scientific knowledge regarding whirling disease and myxospores in the environment, the incidental transfer of M. cerebralis among drainages by anglers is poorly understood. Anglers are highly mobile organisms and have been responsible for the transfer of several invasive species. Last year in conjuncture with this study, MT Fish Wildlife and Parks surveyed 100 anglers fishing in the Missouri River between Wolf Creek, MT and Craig, MT. Anglers were asked several questions regarding where they had fished previous to their Missouri River trip. Eighteen different rivers (i.e., Gallatin, Madison, Beaverhead, Jefferson, Ruby, Yellowstone, Big Hole, Sun, Belt, Mission, Bitterroot, Clark Fork, Blackfoot, Big Horn, Rock, Armstrong, Middle Fork Flathead, Kootenai) had been fished in Montana within one week of fishing in the Missouri River. Further, fourteen rivers (i.e., Good news [AK]; Elk, Blakly, Kispox [BC]; Henry's Fork, South Fork Snake [ID]; Delaware [NY]; Metolinus, Owhwee, Rouge [OR]; Snoqualmie [WA]; Shoshone, Snake, Wind [WY]) outside Montana were fished within one week of their Missouri River trip. Finally, one angler interviewed had fished in New Zealand within one month of his trip to Montana and seven countries outside the U.S. (i.e., Austria, Bermuda, Canada, England, Ireland, Italy, and Norway) were represented by anglers. These preliminary results suggest that anglers are highly mobile within the state and that Montana attracts anglers from around the world. The regional and global movement of anglers is certainly a concern regarding the transfer of aquatic organisms.

We are unaware of any quantitative research that has studied the incidental transfer of M. cerebralis by anglers. We hypothesize that anglers can transfer M. cerebralis among drainages by transporting benthic sediments containing myxospores on wading equipment, boats, and boat trailers. Our inductive reasoning is based on the data that myxospores are found in the sediment, myxospores are highly resilient to environmental stress, fishing equipment often captures benthic sediment, and anglers are highly mobile organisms.

Understanding angler movements and the amount of sediment they transport could be critical information in managing the spread of whirling disease and other invasive species. These data will be useful in developing management strategies to reduce the spread of whirling disease. The alternative hypothesis that anglers are unlikely to spread whirling disease may be found and that also has important management implications.